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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/532,313	11/14/2005	Jerome Assal	004501-810	9970

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BUCHANAN, INGERSOLL & ROONEY PC
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EXAMINER	
JEFFERSON, QUOVAUNDA	
ART UNIT	PAPER NUMBER
2823	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/532,313	ASSAL ET AL.	
	Examiner	Art Unit	
	Quovaunda Jefferson	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 March 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on March 12, 2007 has been entered.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-4 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matthews et al, US Patent 6,905,618 (cited in a previous office action) in view of. Reichert et al, US Patent 4,808,542.

3. Regarding claim 1, Matthews teaches a method for forming a stepped profile from a layer sequence in which, in a first patterning step, a first layer partial sequence **22,** which is at least partially covered by a photoresist layer **30**, is removed apart from a first residual layer partial sequence **14** (Figure 2B), in a second patterning step, a second layer partial sequence **24** located below the first layer partial sequence is partially removed by means of etching with a second etchant (Figure 3B), and in a third patterning step, a third layer partial sequence **26** located below the second layer partial sequence **24** is partially removed by means of etching with a third etchant, wherein the photoresist layer remains during the first, second, and third patterning steps (Figure 3C and Figure 4 and column 4, lines 63-65). Matthews fails to teach

Matthews fails to teach in the second patterning step, a region of the second layer partial sequence that is located below the first residual layer partial sequence is removed, by which a first projection of the first residual layer partial sequence being formed, and in the third patterning step, the first projection of the first residual layer partial sequence is removed

Reichert teaches in the second patterning step, a region of the second layer partial sequence **12** that is located below the first residual layer partial sequence **13** is removed, by which a first projection of the first residual layer partial sequence being formed, and in the third patterning step, the first projection of the first residual layer

partial sequence is removed (figures 5-8) as a means of producing layers with a stepped profile without causing the effect of overhang on the top layers of the stepped profile. This overhang phenomenon, in turn, produces detrimental effects, such as cavity formation, due to further etching of this overhang layer in order to remove the overhang.

It would be obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Reichert with that of Matthews as a means of producing layers with a stepped profile without causing the effect of overhang on the top layers of the stepped profile, which may produce detrimental effects, such as cavity formation, due to further etching of this overhang layer in order to remove the overhang.

4. Regarding claim 2, Reichert teaches the second and third patterning steps are effected in aqueous solution (column 1, lines 49-51 and column 57-67).

5. Regarding claim 3, Matthews teaches wherein the first patterning step is carried out by means of etching with a first etchant (column 4, lines 36-38).

6. Regarding claim 4, Matthews teaches characterized-in that wherein a substantially identical chemical composition is chosen for the first etchant and for the third etchant (column 4, lines 36-38 and column 4, lines 64-67).

7. Regarding claim 9, Matthews teaches wherein prior to the first patterning step, a protective layer **30** is provided on the first layer partial sequence **14/22**.

8. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Matthews and Reichert as applied to claim 1 above, and further in view of Ohori et al, US Patent 6,156,662 (as cited in previous office action).

9. Regarding claim 5, Matthews and Reichert fail to teach in the first patterning step, the first layer partial sequence is removed to an extent such that a second projection of the protective layer arises, which second projection has a length t_1 greater than a thickness d_1 of the first layer partial sequence.

Ohori teaches in the first patterning step, the first layer partial sequence **46a** or **46b** is removed to an extent such that a second projection of the protective layer **48** arises, which second projection has a length t_1 greater than a thickness d_1 of the first layer partial sequence (Ohori, column 10, lines 24-25 and figure 11) because barrier types patterns undergo certain recessions when as a result of using a wet etching process.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Ohori with that of Matthews and

Reichert because barrier types patterns undergo certain recessions when as a result of using a wet etching process

10. Claims 6, 7, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matthews and Reichert as applied to claim 1 above, and further in view of Wood et al, US Patent 3,663,184 (as cited in previous office action).

11. Regarding claim 6, Matthews and Reichert fail to the first layer partial sequence substantially comprises Ag, the second layer partial sequence substantially comprises Ni, and the third layer partial sequence substantially comprises Ti.

Wood teaches the first layer partial sequence **20** substantially comprises Ag, the second layer partial sequence **16** substantially comprises Ni, and the third layer partial sequence **15** substantially comprises Ti (column 3, line 42, column 4, lines 7, and column 4, line 41) by teaching the conventional use of three metals known in the art in the formation of a solder bump pad used in semiconductor package manufacturing.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Wood with that of Matthews and Reichert because Ag, Ni, and Ti are three of the many types of metal conventionally used in the semiconductor art, with one particular use being in the formation of a solder bump pad used in semiconductor package manufacturing.

12. Regarding claim 7, Matthews and Reichert fail to teach an aqueous solution of nitric acid. Is used as a second etchant.

Wood teaches an aqueous solution of nitric acid is used as the second etchant (column 4, lines 7-9) as a conventionally used wet etchant that is well known for selective etching of layers in a semiconductor device.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Wood with that of Matthews and Reichert because nitric acid is a conventionally used wet etchant that is well-known for selective etching of layers in a semiconductor device.

13. Regarding claim 10, Matthews, Reichert, and Woods fail to teach a nitric acid in a dilution ratio of 1:z where $2.0 < z < 8.0$.

However, it would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to choose these particular dimensions because applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere

dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, In re Rose, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); In re Rinehart, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); In re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

14. Claims 8 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matthews and Reichert as applied to claim 3 above, and further in view of Wang et al, US Patent 5,160,492 (as cited in previous office action).

15. Regarding claim 8, Matthews and Reichert fail to teach a mixture of hydrogen peroxide, ammonium hydroxide and water.

Wang teaches a mixture of hydrogen peroxide, ammonium hydroxide and water is used as the first and third etchants preferably in a volume ratio of approximately 1:x:y (column 5, line 3) because the combination of hydrogen peroxide, ammonium hydroxide and water yield a strong etch.

It would be obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Wang with that of Matthews and Reichert because

the combination of hydrogen peroxide, ammonium hydroxide and water yield a strong etch.

16. Regarding claim 11, Matthews, Reichert, and Wang fail to teach a mixture of hydrogen peroxide, ammonium hydroxide and water, preferably in a volume ratio of approximately 1:x: y, where $0.5 < x < 2.0$ and $4.0 < y$ 10.0.

However, it would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to choose these particular dimensions because applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, In re Rose, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); In re Rinehart, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); In re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

Response to Arguments

Applicant's arguments with respect to claims 1-11 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Quovaunda Jefferson whose telephone number is 571-272-5051. The examiner can normally be reached on Monday through Friday, 7AM to 3:30PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

QVJ
QVJ

FERNANDO L. TOLEDO
PRIMARY PATENT EXAMINER